The calculation of elemental concentration in mg/g for the leachate-derived solids was performed using the next equation

$$Elemental\ concentration = \frac{[Element] \cdot V_{da}}{m_{solid}} \quad \text{(S1)}$$

where [*Element*] is the elemental concentration (mg/L) in the solution derived from the acid digestion of leachate-derived solid that was determined by ICP-OES, V_{da} is the volume (L) of the solution derived from acid digestion, and m_{solid} is the mass (g) of leachate-derived solid used in the acid digestion, respectively. Considering that [*Element*] = 0.01 mg/L, which is the limit of quantification for tested elements and equipment used, V_{da} = 1000 mL and m_{solid} = 0.34 ± 0.02 g, a threshold of 0.03 mg/g was reported for LOQ.

For each monthly composite leachate sample, 1 L of the sample was weighted and dried at 50 °C until constant mass was reached, without prior filtration or separation of suspended solids. The total recovered dry residue mass was determined gravimetrically. The dry residue percentage ($\%P_{m_s}$) was calculated on a mass basis according to equation S2:

$$\%P_{m_s} = \frac{m_s}{m_L} * 100 \quad \text{(S2)}$$

where m_s is recovered dry mass (g) and m_L is the leachate mass corresponding to 1 L of tested liquid leachate sample. The estimated yield was calculated according to the following equation:

$$Y = \frac{m_s}{V_L} \quad \text{(S3)}$$

where V_L is the volume of leachate processed (1 L).

Table S1. Estimated monthly dry residue yields of leachate samples from the San Nicolás MSW landfill.

Sampling month	Dry mass, % by mass	Recovered dry mass, g	Estimated yield, g/L
1	10.83	106.62 ± 5.33	106.62 ± 5.33
2	5.06	49.81 ± 2.49	49.81 ± 2.49
3	5.80	57.09 ± 2.85	57.09 ± 2.85
4	3.49	34.32 ± 1.71	34.32 ± 1.71
5	2.59	25.49 ± 1.27	25.49 ± 1.27
6	5.64	55.56 ± 2.77	55.56 ± 2.77
7	2.64	26.04 ± 1.30	26.04 ± 1.30
8	1.22	11.99 ± 0.59	11.99 ± 0.59
9	2.16	21.23 ± 1.06	21.23 ± 1.06
10	2.36	23.26 ± 1.16	23.26 ± 1.16
11	3.21	31.64 ± 1.58	31.64 ± 1.58
12	2.37	23.30 ± 1.16	23.30 ± 1.16

Table S2. Estimated equivalent elemental concentrations (mg/L) in monthly leachate samples from the San Nicolás MSW landfill, which were calculated from the elemental composition and gravimetric dry residue content of the recovered solids.

	Concentration by sampling month, mg/L											
Element	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Ag	1.62	0.75	1.50	1.01	0.75	1.63	0.77	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
Al	<1.62[a]	<0.75[a]	<1.50[a]	2.02	4.50	21.24	12.25	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	2.06
As	1.62	<0.75[a]	<1.50[a]	1.01	<0.75[a]	<1.63[a]	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
B	29.08	39.24	1.50	9.09	15.00	81.71	11.49	4.94	8.12	6.84	7.44	151.44
Ba	8.08	<0.75[a]	3.00	5.05	3.00	4.90	6.89	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	2.74
Be	1.62	0.75	1.50	1.01	0.75	1.63	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
Ca	638.07	275.45	243.38	72.68	71.23	500.06	604.98	117.08	<0.62[a]	<0.68[a]	561.08	143.90
Cd	1.62	0.75	1.50	1.01	0.75	1.63	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
Co	1.62	0.75	<1.50[a]	1.01	0.75	1.63	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
Cr	11.31	4.53	6.01	4.04	3.00	6.54	6.13	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	1.37
Cu	<1.62[a]	<0.75[a]	<1.50[a]	1.01	0.75	1.63	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	2.74
Fe	69.46	10.57	34.55	19.18	28.49	78.44	27.57	6.70	<0.62[a]	<0.68[a]	<0.93[a]	9.59
K	9773.05	4328.65	4780.42	3039.56	1769.49	3394.20	2747.68	281.41	461.39	549.31	66.06	1922.07
Mg	457.15	239.22	247.88	66.63	46.49	268.01	155.46	42.67	31.22	38.99	29.78	56.19
Mn	3.23	2.26	<1.50[a]	1.01	0.75	3.27	4.59	1.41	<0.62[a]	<0.68[a]	< 0.93[a]	<0.69[a]
Mo	3.23	2.26	<1.50[a]	1.01	0.75	1.63	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
Na	13662.88	8262.61	7765.56	3365.62	2121.89	4835.55	5352.15	1375.33	7304.74	998.74	1460.85	3790.69
Ni	8.08	16.60	6.01	2.02	2.25	3.27	4.59	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	2.74
Pb	22.62	3.77	1.50	1.01	0.75	1.63	<0.77[a]	0.71	<0.62[a]	1.37	<0.93[a]	1.37
Sb	1.62	0.75	1.50	1.01	0.75	1.63	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
Se	<1.62[a]	0.75	<1.50[a]	1.01	0.75	1.63	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
Si	1.62	0.75	1.50	1.01	8.25	8.17	32.93	23.27	30.59	33.52	47.45	3723.54
Ti	12.92	2.26	7.51	5.05	1.50	1.63	5.36	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
Tl	1.62	0.75	1.50	1.01	0.75	1.63	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
V	3.23	0.75	<1.50[a]	1.01	0.75	1.63	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	<0.69[a]
Zn	3.23	0.75	<1.50[a]	1.01	0.75	1.63	<0.77[a]	<0.35[a]	<0.62[a]	<0.68[a]	<0.93[a]	3.43

[a] *Value below the limit of quantification (LOQ) and it was replaced for statistical calculations. This value does not represent an experimentally quantified concentration.*

Table S3. Weight values reported by Kumar and Alappat [29] and used in the calculation of HMVI.

	As	*Cr*	*Cu*	*Fe*	*Ni*	*Pb*	*Zn*
w_i	0.061	0.064	0.05	0.045	0.052	0.063	0.056

Table S4. Results of twelve-month monitoring of inorganic elemental composition and pH of leachate-derived solid samples collected from the San Nicolás MSW landfill in Aguascalientes, Mexico.

	Sampling month											
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
pH	6.33	6.63	7.02	6.67	7.01	7.01	7.00	6.97	6.99	6.33	6.91	7.4
	Concentration by sampling month, mg/g											
Ag	0.03	0.03	0.03	0.03	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
Al	<0.03[a]	<0.03[a]	<0.03[a]	0.06	0.18	0.38	0.47	<0.03[a]	<0.03[a]	<0.03[a]	<0.03 [a]	0.09
As	0.03	<0.03[a]	<0.03[a]	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
B	0.27	0.79	0.03	0.26	0.59	1.47	0.44	0.41	0.38	0.29	0.24	6.5
Ba	0.08	<0.03[a]	0.05	0.15	0.12	0.09	0.26	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	0.12
Be	0.03	0.03	0.03	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
Ca	5.98	5.53	4.26	2.12	2.79	9.00	23.24	9.76	<0.03[a]	<0.03[a]	17.74	6.18
Cd	0.03	0.03	0.03	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
Co	0.03	0.03	<0.03[a]	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
Cr	0.11	0.09	0.11	0.12	0.12	0.12	0.24	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	0.06
Cu	<0.03[a]	0.03	<0.03[a]	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	0.12
Fe	0.65	0.21	0.61	0.56	1.12	1.41	1.06	0.56	<0.03[a]	<0.03[a]	<0.03[a]	0.41
K	91.67	86.91	83.74	88.56	69.41	61.09	105.53	23.47	21.74	23.62	2.09	82.50
Mg	4.29	4.83	4.34	1.94	1.82	4.82	5.97	3.56	1.47	1.67	0.94	2.41
Mn	0.03	0.05	<0.03[a]	0.03	0.03	0.06	0.18	0.12	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
Mo	0.03	0.03	<0.03[a]	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
Na	128.15	165.89	136.03	98.06	83.24	87.03	205.56	114.71	344.12	42.94	46.18	162.71
Ni	0.08	0.333	0.11	0.06	0.09	0.06	0.18	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	0.12
Pb	0.21	0.08	0.03	0.03	0.03	0.03	<0.03[a]	0.06	<0.03[a]	0.06	<0.03[a]	0.06
Sb	0.03	0.03	0.03	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
Se	<0.03[a]	0.03	<0.03[a]	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
Si	0.03	0.03	0.03	0.03	0.32	0.15	1.26	1.94	1.44	1.44	1.50	159.82
Ti	0.12	0.05	0.13	0.15	0.06	0.03	0.21	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]

Tl	0.03	0.03	0.03	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
V	0.03	0.03	<0.03[a]	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]
Zn	0.03	0.03	<0.03[a]	0.03	0.03	0.03	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	<0.03[a]	0.15

Limit of quantification (LOQ) of ICP-OES was 0.01 mg/L. Elemental concentrations are expressed in mg/g of recovered dried solid. pH refers to the original liquid leachate.

[a] *Value below the limit of quantification (LOQ) and it was replaced by 0.03 mg/g for statistical calculations. This value does not represent an experimentally quantified concentration.*

Table S5. Coefficient of variation (*CV*) calculated for the inorganic elemental composition of leachate-derived solid samples collected from San Nicolás MSW landfill in Aguascalientes, Mexico, during the annual monitoring period.

Parameter	***CV*, %**	**Parameter**	***CV*, %**
Ag	-	*Mg*	52.172
Al	131.364	*Mn*	87.821
As	-	*Mo*	-
B	182.957	*Na*	60.792
Ba	82.200	*Ni*	91.113
Be	-	*Pb*	90.714
Ca	97.038	*Sb*	-
Cd	-	*Se*	-
Co	-	*Si*	328.072
Cr	67.451	*Ti*	82.290
Cu	69.282	*Tl*	-
Fe	81.862	*V*	-
K	56.184	*Zn*	86.603

CV values were calculated using the sample standard deviation and mean concentrations, with values below the common reporting threshold of 0.03 mg/g substituted by 0.03 mg/g. A dash (—) indicates elements for which the *CV* was not reported because all monthly concentrations were at or below the reporting threshold.

Table S6. Pearson correlation coefficient matrix for pH and inorganic elemental concentrations in leachate-derived solid samples collected from the San Nicolás MSW landfill in Aguascalientes, Mexico, during the annual monitoring period.

	pH	*B*	*Ba*	*Ca*	*Cr*	*Fe*	*K*	*Mg*	*Na*	*Ni*	*Pb*	*Si*	*Ti*
pH	1.000												
B	0.576*	1.000											
Ba	0.143	-0.040	1.000										
Ca	0.176	-0.127	0.785*	1.000									
Cr	-0.044	-0.475	0.817*	0.844*	1.000								
Fe	0.200	-0.203	0.200	0.352	0.509	1.000							
K	0.025	0.203	0.607	-0.237	0.506	-0.084	1.000						
Mg	-0.003	-0.069	0.275	0.263	0.541	0.186	0.645*	1.000					
Na	0.296	0.095	0.601	0.201	0.383	-0.352	0.132	0.154	1.000				
Ni	-0.119	-0.022	0.696	0.226	0.052	-0.504	0.356	0.429	0.638	1.000			
Pb	-0.553	-0.076	-0.298	0.154	-0.122	-0.244	0.239	0.293	0.244	0.048	1.000		
Si	0.636	0.981*	-	-0.552	-	-	0.424	-0.137	0.081	-	-	1.000	
Ti	-0.025	-0.701	0.640	0.530	0.694	-0.112	0.842*	0.197	0.565	-0.122	0.204	-	1.000

Pearson correlation coefficients were calculated using unrounded concentrations. Values below LOQ were excluded by pairwise deletion. Only correlations with at least five valid paired observations ($n \geq 5$) are reported; dashes (—) indicate fewer observations. Asterisks (*) indicate statistical significance ($p < 0.05$, two-tailed, unadjusted). Correlations were considered exploratory because no adjustment for multiple comparisons was applied. The corresponding n and p values are provided in Table S7.

Table S7. Pearson correlation coefficients (*r*), number of valid paired observations (*n*), and corresponding *p* values for pH of liquid leachate sample and inorganic elemental concentrations in leachate-derived solid samples collected from the San Nicolás MSW landfill in Aguascalientes, Mexico, during the annual monitoring period.

Variable 1	Variable 2	*N*	*r*	*p*
B	pH	12	0.5764	0.0498
Ba	pH	7	0.1427	0.7602
Ba	B	7	-0.0400	0.9322
Ca	pH	10	0.1764	0.6260
Ca	B	10	-0.1274	0.7257
Ca	Ba	7	0.7854	0.0364
Cr	pH	8	-0.0443	0.9171
Cr	B	8	-0.4753	0.2340
Cr	Ba	7	0.8169	0.0249
Cr	Ca	8	0.8442	0.0084
Fe	pH	9	0.2005	0.6051
Fe	B	9	-0.2027	0.6010
Fe	Ba	7	0.2001	0.6670
Fe	Ca	9	0.3521	0.3527
Fe	Cr	8	0.5092	0.1974
K	pH	12	0.0251	0.9383
K	B	12	0.2030	0.5268
K	Ba	7	0.6067	0.1486
K	Ca	10	-0.2373	0.5091
K	Cr	8	0.5063	0.2004
K	Fe	9	-0.0838	0.8303
Mg	pH	12	-0.0029	0.9929
Mg	B	12	-0.0687	0.8320
Mg	Ba	7	0.2752	0.5503
Mg	Ca	10	0.2625	0.4637
Mg	Cr	8	0.5407	0.1665
Mg	Fe	9	0.1860	0.6318
Mg	K	12	0.6445	0.0237
Na	pH	12	0.2961	0.3500

Na	B	12	0.0948	0.7694
Na	Ba	7	0.6014	0.1531
Na	Ca	10	0.2007	0.5782
Na	Cr	8	0.3832	0.3488
Na	Fe	9	-0.3522	0.3527
Na	K	12	0.1322	0.6822
Na	Mg	12	0.1538	0.6332
Ni	pH	8	-0.1188	0.7793
Ni	B	8	-0.0217	0.9594
Ni	Ba	7	0.6963	0.0823
Ni	Ca	8	0.2256	0.5911
Ni	Cr	8	0.0523	0.9021
Ni	Fe	8	-0.5040	0.2028
Ni	K	8	0.3562	0.3865
Ni	Mg	8	0.4287	0.2892
Ni	Na	8	0.6383	0.0885
Pb	pH	9	-0.5527	0.1228
Pb	B	9	-0.0762	0.8455
Pb	Ba	6	-0.2979	0.5664
Pb	Ca	8	0.1538	0.7161
Pb	Cr	7	-0.1219	0.7946
Pb	Fe	8	-0.2440	0.5604
Pb	K	9	0.2389	0.5358
Pb	Mg	9	0.2931	0.4441
Pb	Na	9	0.2441	0.5267
Pb	Ni	7	0.0476	0.9193
Si	pH	7	0.6360	0.1247
Si	B	7	0.9813	0.0001
Si	B (excluding December)	6	-0.9094	0.0119
Si	Ba	3	—	—
Si	Ca	5	-0.5519	0.3348
Si	Cr	3	—	—
Si	Fe	4	—	—
Si	K	7	0.4240	0.3431
Si	Mg	7	-0.1372	0.7693

Si	Na	7	0.0813	0.8625
Si	Ni	3	—	—
Si	Pb	4	—	—
Ti	pH	7	-0.0246	0.9582
Ti	B	7	-0.7006	0.0795
Ti	Ba	6	0.6399	0.1711
Ti	Ca	7	0.5296	0.2215
Ti	Cr	7	0.6944	0.0834
Ti	Fe	7	-0.1121	0.8108
Ti	K	7	0.8421	0.0174
Ti	Mg	7	0.1969	0.6722
Ti	Na	7	0.5650	0.1863
Ti	Ni	7	-0.1224	0.7937
Ti	Pb	6	0.2035	0.6989
Ti	Si	2	—	—

Pearson correlation coefficients were calculated using unrounded concentrations. Values below LOQ were excluded by pairwise deletion. Correlations with fewer than five valid paired observations ($n < 5$) were not reported (—). Reported p values are two-tailed and unadjusted for multiple comparisons; all correlations were considered exploratory. The B–Si correlation excluding December was included as a sensitivity analysis.